

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-35

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2009 Survey Report

Lake Fork Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Largemouth bass in Lake Fork Reservoir were surveyed in 2009 and 2010 using electrofishing. Anglers were surveyed with an access point creel survey, and a vegetation survey was conducted to assess water hyacinth distribution and coverage. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Lake Fork Reservoir is a 27,264-acre impoundment located on Lake Fork Creek, a tributary of the Sabine River, approximately five miles northwest of Quitman, Texas. Water levels have been stable for the past 12 months, remaining within an average of 0.2 feet of conservation pool elevation. Water hyacinth distribution and coverage increased as a result of two successive mild winters in 2007 to 2008 and 2008 to 2009 and favorable environmental factors such as high rainfall, windy conditions and early onset of summertime temperatures that encouraged its growth and spread.
- **Management history:** Important sport fishes include largemouth bass, crappie (white and black), and channel catfish. The management plan from the 2009 survey report included continued stocking of Florida largemouth bass (FLMB). The 16- to 24-inch slot-length limit continues to be evaluated through annual electrofishing surveys and an access creel survey. District staff continued to promote the Lake Fork Trophy Bass Survey. Water hyacinth abundance and distribution is monitored through annual vegetation surveys and recommendations are made to continue annual herbicide treatments to attempt to control its spread.
- **Fish community**
 - **Prey species:** Abundant shad (threadfin and gizzard) and sunfish populations provided adequate prey for largemouth bass and crappie. Good body conditions of largemouth bass provide conclusive evidence that prey fish are not limiting. The majority of shad species were available as prey for adult largemouth bass. The majority of bluegill collected in 2009 measured less than five inches in length, a suitable prey size for most size classes of largemouth bass.
 - **Catfishes:** Catfish accounted for 5% of total angler effort. Channel catfish were the predominant catfish species although flathead catfish, blue catfish, and yellow bullheads were also present. Total catch per hour in the creel survey was 1.73/h and harvest rate was 1.18/h.
 - **Temperate basses:** White bass, yellow bass, white x yellow bass hybrids, and palmetto bass were all present in the reservoir. Harvest of yellow bass and white bass was observed during creel surveys.
 - **Largemouth bass:** Largemouth bass are the most popular game fish in Lake Fork, accounting for over 73% of total angler effort in 2009 to 2010. Number and range of size groups remained consistent and body conditions were high. Largemouth bass continued to grow rapidly.
 - **Crappie:** Crappie accounted for almost 21% of total directed effort in 2009 to 2010. During the winter quarter (December 2009 through February 2010), 55% of the annual harvest of crappie was observed, but angler effort was highest in spring.
- **Management strategies:** Annual actions include: stocking FLMB, spring and fall electrofishing for largemouth bass population assessment, an access point creel survey to monitor angler effort, and angler catch and harvest rates, annual vegetation surveys of water hyacinth and distribution, and promotion of the Lake Fork Trophy Bass Survey. In addition, the water hyacinth management plan will be used to guide treatment activities.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Fork Reservoir June 2009 through May 2010. The purpose of the document is to provide an annual update to fisheries information contained in a more comprehensive report composed every four years, most recently completed in August 2009 (Storey and Jubar 2009). This document serves a second purpose by updating the 2009 management recommendations to protect and improve the sport fishery. While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Relevant historical data are presented with the 2009 and 2010 data for comparison.

Reservoir Description

Lake Fork Reservoir is a 27,264-acre reservoir impounded in 1980 on Lake Fork Creek and Caney Creek. It is located approximately five miles northwest of Quitman, Texas, in Wood, Rains and Hopkins Counties. It is operated and controlled by the Sabine River Authority (SRA) primarily as a municipal water supply and for recreation. The reservoir was hypereutrophic with a Carlson's Trophic State Index (TSI) chl-a of 55.7 µg/L (Texas Commission on Environmental Quality 2008). Descriptions of fisheries habitat features (e.g., structural and aquatic vegetation) and angler access were described in a previous report (Storey and Jubar 2008). Monthly average water levels remained within 0.2 feet of conservation pool elevation for the last year (Figure 1). Other descriptive characteristics for Lake Fork Reservoir are shown in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Storey and Jubar 2008) included:

1. Management of largemouth bass fishery.

Actions:

- Stocked 515,444 Florida largemouth bass fingerlings (FLMB) in 2010.
- Conducted genetic analysis on sample of age-0 largemouth bass collected during fall electrofishing; 48% FLMB allele composition, all fish in sample were second or higher generation intergrades (Fx) between FLMB and Northern largemouth bass (NLMB).
- Conducted electrofishing sampling in fall 2009 and spring 2010 to monitor abundance, size distribution, and condition of largemouth bass, and abundance and size distribution of prey species.
- Conducted access point creel survey from June 1, 2009 to May 31, 2010 to estimate angler catch and harvest rates, and fishing effort.
- Continued to monitor angler catches of trophy bass ≥ 24 inches and/or 7 pounds through the Lake Fork Trophy Bass Survey.
- Communicated proper handling techniques for large bass through posting of information at display boards at boat ramps and in fishery-related businesses at Lake Fork.

2. Management of invasive aquatic plants.

Actions:

- Conducted aquatic vegetation survey to assess distribution and acreage of water hyacinth in Lake Fork in September 2009. Total estimated area was 200 acres which excluded inaccessible upper reaches of some major creeks (additional 200 acres).
- Aquatic Habitat Enhancement (AHE) staff from TPWD treated 102 acres of water hyacinth on Lake Fork in summer 2009.
- Alligatorweed fleabeetles (6,000) obtained from the US Army Corps of Engineers in Jacksonville, Florida, were released at 20 sites on Lake Fork in May 2009.
- All reports of unusual or unknown aquatic plants reported by anglers and

homeowners at Lake Fork were investigated.

- A total of 19 aquatic vegetation treatment proposals submitted by property owners at Lake Fork were approved. Primary target plants were alligatorweed and water hyacinth.
- Staff continued to post materials regarding invasive aquatic plants at area boat ramps and local businesses at Lake Fork.
- Prepared “Nuisance Aquatic Vegetation Management Plan for Lake Fork Reservoir” and presented it to the general public at the “State of the Lake Meeting” in February 2010.

3. Lake Fork Trophy Bass Survey

Actions:

- Continued to promote the Lake Fork Trophy Bass Survey. During the review period a total of 910 trophy largemouth bass were entered into the survey. To date 11,057 trophies have been submitted.
- Summaries of catches were provided to participating marinas and outdoor media. A decision was made to decrease the frequency of summaries sent to outdoor writers. Releases will be sent to them on a quarterly basis.
- Staff continued to promote the program by displaying laminated posters at participating marinas and at public and private boat ramps.
- District staff recognized the work of participating marinas by presenting them with certificates of appreciation.

4. Increase angler awareness of the fisheries resources at Lake Fork

Actions:

- District staff provided laminated posters detailing fisheries regulations in effect at Lake Fork to local fishing-related businesses that serve the Lake Fork area, for display in stores and at boat ramps.
- Staff co-sponsored “State of the Lake” meeting in February 2010 with the Wood County Industrial Commission to provide a status report on Lake Fork to interested parties.
- Staff continued to provide news releases promoting fisheries resources of Lake Fork. Biologist Jubar submitted monthly articles to “The Fisherman’s News”.
- Staff continued to provide information on Lake Fork facilities to interested anglers.

Harvest regulation history: Sport fishes in Lake Fork Reservoir are managed with statewide regulations with the exception of largemouth bass and crappie (Table 2). A detailed harvest regulation history is provided in the most recent 4-year summary report (Storey and Jubar 2008).

Stocking history: Lake Fork Reservoir has a long history of FLMB stockings. Other species (e.g., spotted bass, channel catfish, blue catfish, flathead catfish, bluegill, and redear sunfish) were stocked on one to four occasions prior to 1985. A detailed stocking history is provided in Table 3.

Vegetation/habitat history: Lake Fork Reservoir supports a diverse mix of aquatic vegetation species, including invasive species such as hydrilla, eurasian watermilfoil, water hyacinth, and alligatorweed. To date, hydrilla and eurasian watermilfoil have not created any problems in the reservoir. A detailed aquatic vegetation history is provided in the most recent 4-year summary report (Storey and Jubar 2008). Water hyacinth continued its expansion to approximately 400 acres.

METHODS

Largemouth bass were collected by electrofishing (2 hours at 24, 5-min stations) in fall 2009 and spring 2010. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour

(fish/h) of actual electrofishing. Survey sites were randomly selected. An access point angler creel survey consisting of 36 survey days (4 weekdays, 5 weekend days per quarter from June 2009 through May 2010) was conducted to estimate angler catch and harvest rates and angling effort in accordance with Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009). An aquatic vegetation survey for water hyacinth was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009).

Anglers were interviewed regarding their preferences about catfish angling on Lake Fork from September 2008 through August 2009. The four questions that were posed are presented in Appendix H. Only those anglers who fished for catfish were interviewed. A total of 50 interviews were conducted.

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), as defined by Guy et al. (2007)], and relative weight (W_r) were calculated for target fishes according to Anderson and Neumann (1996). Relative standard error ($RSE = 100 \times [SE \text{ of the estimate} / \text{estimate}]$) was calculated for all CPUE statistics and for creel statistics and SE was calculated for structural indices.

Ages were determined for largemouth bass using otoliths from 10 specimens with length classes ranging from 15 to 17 inches. A sample of 30 age-0 largemouth bass were collected by electrofishing in fall 2009 and subjected to genetic analysis using DNA microsatellite analysis in accordance with Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2009).

The Lake Fork Trophy Bass Survey was continued using methods described in Storey and Jubar (2008).

Water elevation data (Figure 1) was obtained from the SRA website at http://www.sra.dst.tx.us/basin/lake_fork_monthly.asp.

RESULTS AND DISCUSSION

Habitat: Reservoir water elevation remained stable for the last two years, maintaining an average monthly elevation at conservation pool (Figure 1). Water hyacinth coverage increased from an estimated 39 acres in 2008 to over 200 acres in September 2009 (Appendix C and F). The most recent estimate did not include inaccessible areas at the upstream extent of some creeks where infestations are known to exist. These areas may have represented a further 200 acres in area. This progression had been facilitated by a series of mild winters in which increased over-winter survival, early onset of hot weather which accelerated growth rates, and heavy rainfall and high winds in spring which enabled the spread of colonies to formerly un-infested areas. Unseasonably cold weather in January 2010 has had a marked impact on over-winter survival of water hyacinth at Lake Fork, leading to a reduction in the quantity and distribution observed in spring 2010.

Creel: Directed fishing effort for largemouth bass was highest (73.5%) compared to other species, but lower than in previous years (Table 4). Directed effort for crappie increased by approximately 50% over the previous year's effort and it remained second in importance (20.9%) (Table 9). The percent directed efforts for largemouth bass and crappie were similar to levels observed in 2003 to 2004. Catfish was third in importance at 5.0% of total directed effort. Total fishing effort for all species (709,457 h) declined to 63% of the peak level observed in the previous year (1,128,269 h) (Table 5); in fact directed effort observed in spring 2009 (March-May) (719,991 h) was higher than the entire year's effort in 2009 to 2010. Total directed expenditures (\$7,569,111) were 49% of the maximum (\$15.3 million) observed in 2008 to 2009. As expected, spring was the busiest and most lucrative season, accounting for 47% of fishing effort (331,621 h) and 53% of trip expenditures (\$4,006,193) (Appendix G).

Prey species: Lake Fork contained abundant clupeid and sunfish populations. Catch rate of gizzard shad in fall electrofishing (148.5/h) was higher than previous years (Figure 2), but the index of

vulnerability (IOV) indicated only 50% of gizzard shad were available to most predator fish. Threadfin shad (54.5/h) also provided prey for largemouth bass and crappie (Appendix A). The majority of bluegill collected in 2009 fall electrofishing samples measured 4 inches or less in length (Figure 3), which was similar to size distributions observed in previous years. Total catch rate in 2009 was 243.0/h. Electrofishing catch rate of redear sunfish (59.5/h) was lower than bluegill and size distribution was skewed towards larger fish (Figure 4). Few sunfish were observed in the creel survey. The high relative weights observed in largemouth bass indicate adequate availability of prey species in Lake Fork (Figure 6 and Figure 7).

Channel catfish: Catfish remained the third most popular group in terms of directed angler effort, accounting for 5% of total effort. Fishing effort in 2009 to 2010 (35,112 h) was similar to the past two years (Table 6). Total catch rate was 1.73/h (Table 6). Although the estimated harvest of catfish (68,724 h) was much lower than in the previous year, harvest rate (1.18/h) was actually higher. Anglers harvested 60% of the catfish caught in 2009 to 2010, but 49% of legal-sized channel catfish caught were released. Harvested fish ranged in length from 10 to 24 inches (Figure 5), and illegal harvest accounted for less than 2% of the total. Other catfish species, including blue catfish, flathead catfish, and yellow bullhead were present in the reservoir but contributed little to the rod-and-reel fishery. Anglers who fished for catfish were overwhelmingly satisfied with the catfish regulations at Lake Fork (Appendix H). The majority of anglers had no preference in determining a fishing trip to be successful when asked to choose between larger numbers of legal-sized fish or fewer trophy sized fish. If anglers caught larger catfish, most indicated they would release them. Support for more restrictive catfish regulations designed to develop trophy fisheries was mixed (Appendix H).

Temperate basses: White bass, yellow bass, white x yellow bass hybrids, and palmetto bass were present in the reservoir, but no directed angling effort was observed for these species. Population characteristics of temperate basses were described in a previous report (Storey and Jubar 2008). Anecdotal evidence suggests anglers report catches of white bass with increased frequency. In May 2009, a lake record palmetto bass (7.96 lbs) was certified in Lake Fork (Appendix D). These fish have never been stocked by TPWD and no reservoirs containing them exist upstream of Lake Fork.

Largemouth bass: The largemouth bass population has remained stable and continues to provide a high-quality fishery. Population size structure remained stable with PSD in fall samples ranging from 34 to 50 (Figure 6) and spring sample index values ranging from 73 to 78 (Figure 7) during the past three electrofishing surveys. Electrofishing catch rate was 170.0/h in fall 2009 (Figure 6), and 84.0/h in spring 2010 (Figure 7). Mean relative weights of all sizes of fish within the protected slot limit were above 95 in both spring and fall, with the exception of one inch class in spring 2009 (Figure 6 and Figure 7). These high body condition values confirmed the presence of abundant and readily-available prey fish populations. Largemouth bass in Lake Fork grew to the lower end of the protected slot-length limit in three or four years; average age at 16 inches (15.3–16.8 inches) was 3.2 years (N = 10; range = 2 – 4 years).

Catch rate for anglers targeting largemouth bass during 2009 to 2010 (0.64/h) was the highest recorded in the review period which extends back to 2003 to 2004 (Table 7). This increase is probably the result of decreased fishing effort during the past year. In 2009 to 2010, largemouth bass harvest rate was 0.06/hour. Directed angler effort for largemouth bass at Lake Fork has decreased in the past year with a total effort of 521,650 h, but it continues to be a high-pressure fishery (Table 7). The contribution of largemouth bass fishing effort (74%) to the total effort was lower in 2009 to 2010, but remained dominant compared to other species (Table 4). The spring 2010 creel quarter (March through May) received 47% of the total annual effort observed at Lake Fork and accounted for 50% of the total directed effort for largemouth bass (Appendix G), lower than the contributions made in spring 2009 (68%) or spring 2008 (61%) (Storey and Jubar 2009). Bass fishing in summer (June through August) accounted for 30% of total annual effort, followed by fall (September through November; 11%) and winter (December through February; 9%) (Appendix G).

Live-release tournaments contributed the majority of largemouth bass harvest observed in creel surveys and accounted for 83 to 95% of the harvested fish observed in the last five years (Table 7). Fishing effort by these tournament participants in 2009 to 2010 decreased to the level observed in 2005 to 2006 and accounted for 15% of total directed effort on largemouth bass. This decline followed a steady increase in the previous four years.

Standard fisheries sampling methods do not effectively sample fish longer than the upper end of the slot length limit (≥ 24 inches), making evaluation of the 16- to 24-inch slot limit difficult. Catch rate of largemouth bass ≥ 24 inches reported in creel surveys by largemouth bass anglers was low (0.006/h). The Lake Fork Trophy Bass Survey (Appendix E) has provided an alternative method of collecting data on trophy-sized fish and it provides evidence that the slot limit is providing anglers the opportunity to catch large numbers of fish over 24 inches. Between June 2009 and May 2010, 910 trophy largemouth bass were entered into the survey. A total of 11,057 largemouth bass have been reported to date (March 2003 through May 2010) by anglers from 47 states and the District of Columbia. Anglers measured 63.7% of their entries, and 33.3% of these were ≥ 24 inches. Fish in the 22- and 23-inch classes were most abundant of the measured entries, representing 28.0% and 31.2% of the total, respectively. Anglers weighed 83.2% of their entries, and of these fish, 15.7% were ≥ 10 pounds. By far, the vast majority of entries were 7-pound (40.7%) and 8-pound fish (29.3%). The top 5 states of reporting-angler origin were Texas (62.4%), Oklahoma (6.9%), Missouri (5.9%), Louisiana (5.0%), and Arkansas (3.8%). With the exception of 2010, more trophy fish catches were reported in March than in any other month.

In 2009, FLMB allele frequency of age-0 fish was 48.0%, within the range observed since 1989 (32–58%) (Table 8). No pure Florida bass were observed in the sample of age-0 fish collected in fall 2009, in fact all of the fish were second or higher generation intergrades between FLMB and NLMB.

Crappie: Crappies were the second most popular sport fish at Lake Fork (Table 4). Directed effort for crappie in 2009 to 2010 (147,925 h) was at the highest level observed of the 7 years in the review (Table 9) and angler catch rate (1.49/h; black and white combined) was lowest during the same period. Crappie harvest rate (0.87/h) increased, but total estimated crappie harvest (126,472) decreased.

Black crappie continued to be the dominant species harvested in the 2009 to 2010 creel survey (90%). The 10-inch class was the most abundant crappie (black and white combined) size class harvested, accounting for 49% of fish observed in creel surveys (Table 9). Angler compliance with the 10-inch minimum length limit in effect from March through November was high; illegal fish accounted for 3.5% of harvest during this time. During the winter quarter (December through February) when there is no minimum length limit, crappie measuring less than 10 inches accounted for 15% of the quarter's total harvest (Figure 9), lower than the four previous years (44%, 39%, 43%, and 69%) (Storey and Jubar 2009). The winter quarter accounted for 55% of the year's crappie harvest. Directed effort for crappie was highest in spring (56,384 h) and the other three seasons experienced similar levels of effort (winter - 31,166 h, summer - 30,930 h, and fall - 29,445 h).

Fisheries management plan for Lake Fork Reservoir, Texas

Prepared – July 2010.

ISSUE 1: Lake Fork has a well-established history of producing trophy largemouth bass.

MANAGEMENT STRATEGIES

1. Stock FLMB (25/acre) annually to influence genetics and maintain trophy largemouth bass catch potential.
2. Monitor genetic composition of age-0 largemouth bass population by assessing allele frequency from samples collected during fall electrofishing in 2011.
3. Continue to monitor the largemouth bass population with biannual electrofishing surveys (spring and fall).
4. Continue to conduct annual access creel survey to monitor the fishery and collect data on catch, harvest, and fishing effort. Begin to collect data on numbers of released bass in the following size ranges; 4-6.9 lbs, 7-9.9 lbs and ≥ 10 lbs.
5. Monitor angler catches of trophy bass (≥ 24 inches and/or ≥ 7 pounds) through the Lake Fork Trophy Bass survey.
6. Communicate proper handling techniques for large (≥ 7 pounds) bass (e.g., promote news release of proper holding to minimize lower jaw injuries).

ISSUE 2: Water hyacinth currently poses the major threat of any invasive aquatic plant currently in Lake Fork. Lake Fork contains three additional invasive aquatic plants: hydrilla, water hyacinth, Eurasian watermilfoil and alligatorweed. Although hydrilla is listed as an invasive aquatic plant, it has not created access problems on Lake Fork and it is generally considered an important component of the reservoir's aquatic habitat. Eurasian watermilfoil is not considered problematic but it does appear to be displacing hydrilla from certain areas. Alligatorweed has expanded as water levels increased following drought. Landowners submit aquatic vegetation treatment proposals more frequently alligatorweed than for any other species.

In February 2010, TPWD staff prepared the "Nuisance aquatic vegetation management plan for Lake Fork Reservoir" in order to address this issue. TPWD AHE staff will contract herbicide treatment to an independent spray contractor in summer 2010 using funds provided by the Sabine River Authority, the Texas Parks and Wildlife Department, and the Lake Fork Sportsman's Association.

MANAGEMENT STRATEGIES

1. Conduct annual vegetation survey in order to map distribution and acreage of water hyacinth in Lake Fork.
2. Treat water hyacinth using foliar applications of 2,4-D-based herbicides by contract herbicide applicator.
3. Conduct post-treatment vegetation survey to evaluate effectiveness of herbicide application.
4. Evaluate 2010 aquatic plant management efforts and develop management plan for 2011.
5. Release alligatorweed fleabeetles in areas infested with alligatorweed if insects become available.
6. Investigate reports of unusual or unknown aquatic plants in Lake Fork by anglers and homeowners at the earliest possible opportunity.
7. Continue to review aquatic vegetation treatment proposals submitted by Lake Fork homeowners for control of noxious aquatic vegetation.

ISSUE 3: Participation in the Lake Fork Trophy Bass Survey has shown evidence of an increase in entries during the last few months. This survey contributes vital information on the trophy

component of the largemouth bass population not easily obtained by traditional sampling methods.

MANAGEMENT STRATEGIES

1. Continue the Lake Fork Trophy Bass Survey to obtain information on the catches of largemouth bass ≥ 7 pounds as well as fish ≥ 24 inches. Data gathered through this program will be used to quantify the catches of trophy bass as well as to monitor the performance of the slot-length limit.
2. Provide monthly summaries of catches by weight class to participating marinas and local media. Produce news releases summarizing survey results on a quarterly basis and distribute information on a statewide basis.
3. Continue to promote the program by providing laminated posters for display at public and private boat ramps and in area businesses. Provide marina ledgers to participants on a monthly basis.
4. Continue to encourage participation by marinas, anglers, and guides.

ISSUE 4: Angler awareness of the fisheries resources at Lake Fork other than largemouth bass could be enhanced. There is an opportunity to inform anglers of the significant fisheries for channel catfish and white bass. Fisheries regulations need to be prominently displayed and clearly communicated to anglers. District staff will continue efforts to educate resource users about identification of invasive aquatic species and the consequences of introductions of new species such as giant salvinia and zebra mussels

MANAGEMENT STRATEGIES

1. Continue to provide posters detailing fisheries regulations in effect at Lake Fork to local fishing-related businesses that serve the Lake Fork area for display in stores and at boat ramps.
2. Continue to produce news releases promoting the fisheries resources of Lake Fork for distribution to local lake papers and other media outlets.
3. Co-sponsor another "State of the lake meeting" in October 2010 with the Wood County Industrial Commission.
4. Continue to provide information packets on Lake Fork facilities to interested anglers by mail and e-mail.
5. Continue efforts to educate the public on identification of invasive aquatic plants and consequences of their introductions into public water.
6. Provide information on identification of zebra mussels, and encourage reporting of any suspicious cases.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes annual electrofishing sampling in spring and fall to monitor the largemouth bass population (Table 10), a gill net survey to monitor catfish species and temperate basses in spring 2012, and a standard ongoing annual access creel survey to monitor the lake's fisheries. Water hyacinth distribution and abundance will continue to be monitored through a vegetation survey.

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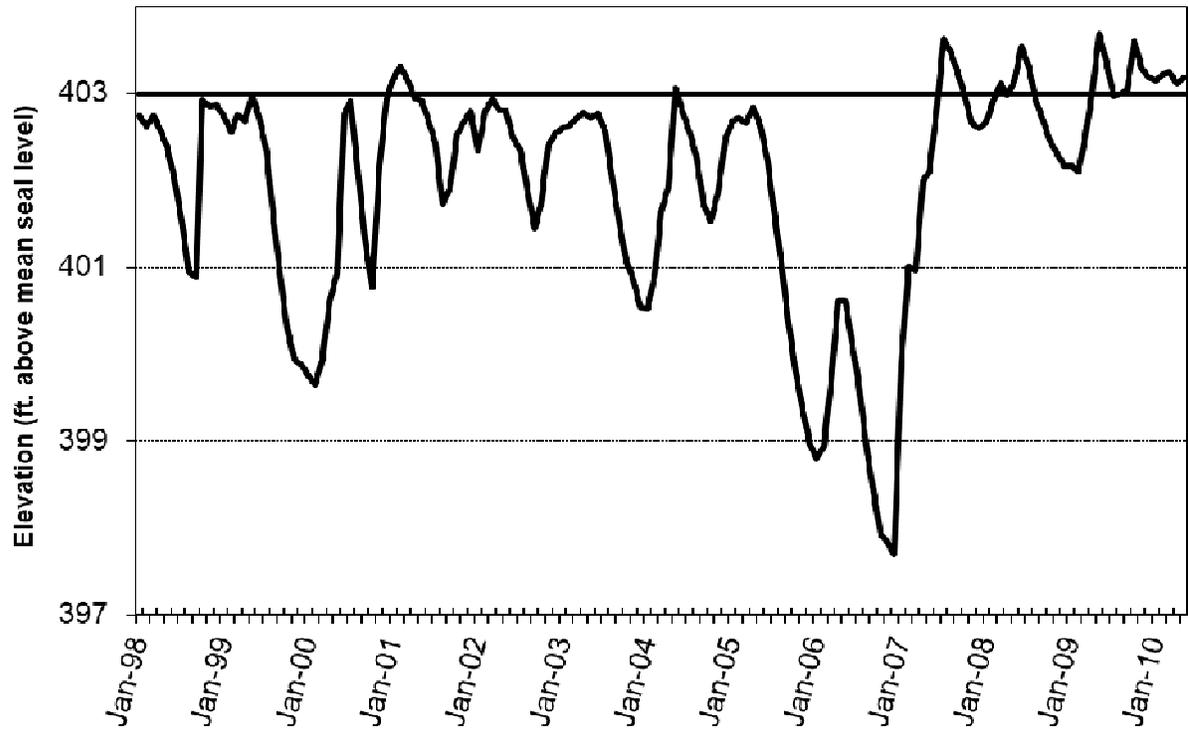


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for Lake Fork Reservoir, Texas, January 1998 through May 2010. Bold horizontal line indicates conservation pool elevation; 403 ft. msl.

Table 1. Characteristics of Lake Fork Reservoir, Texas.

Characteristic	Description
Year constructed	1980
Controlling authority	Sabine River Authority
Surface area	27,264 acres
Counties	Wood (location of dam), Hopkins, Rains
Reservoir type	Mainstream
Mean depth	12.0 ft.
Maximum depth	70.0 ft.
Shoreline development index (SDI)	13.5
Conductivity	135 $\mu\text{mho} / \text{cm}$
Secchi disc range	4 – 6 ft.
Watershed area	490 mi^2

Table 2. Harvest regulations for Lake Fork Reservoir, Texas.

Species	Bag limit	Minimum-Maximum length (inches)
Catfish, channel and blue, their hybrids and subspecies	25 (in any combination)	12 - No limit
Catfish, flathead	5	18 - No limit
Bass, white	25	10 - No limit
Bass, largemouth	5 (1 fish 24 inches or longer)	16 – 24 slot length limit
Crappie, white and black, their hybrids and subspecies	25 (in any combination)	10 ¹ - No limit

¹The minimum length limit is waived from December 1 to the last day of February each year. Anglers must harvest the first 25 crappie caught, regardless of size, with no catch-and-release or culling.

Table 3. Stocking history of Lake Fork Reservoir, Texas. Size categories are: FRY =<1 inch; FGL = 1-3 inches; AFGL = 8 inches, and ADL = adults.

Year	Number	Size	Year	Number	Size
<u>Blue catfish</u>			<u>Florida largemouth bass</u>		
1980	268,423	FGL	1978	103	ADL
1984	29,676	FGL	1979	740,815	FGL
1985	253,464	FGL	1979	561	ADL
	<u>551,563</u>		1980	330,800	FRY
			1980	300	ADL
<u>Channel catfish</u>			1982	49	ADL
1977	37,787	FGL	1987	250	AFGL
1978	80,130	FGL	1995	692,281	FGL
1980	137,545	FGL	1996	697,731	FGL
1984	102,103	FGL	1997	698,037	FGL
	<u>357,565</u>		1998	694,211	FGL
			1999	710,761	FGL
<u>Flathead catfish</u>			2000	510,737	FGL
1979	4,800	FGL & ADL	2001	218,240	FGL
	<u>4,800</u>		2002	692,258	FGL
			2003	732,049	FGL
<u>Redear sunfish</u>			2004	515,101	FGL
1981	36,000	FGL	2005	705,986	FGL
	<u>36,000</u>		2006	506,113	FGL
			2007	501,174	FGL
<u>Coppernose bluegill</u>			2008	501,220	FGL
1981	633,911	FGL	2009	682,702	FGL
	<u>633,911</u>		2010	515,444	FGL
				<u>10,646,923</u>	
<u>Spotted bass</u>					
1979	41	ADL			
	<u>41</u>				

Table 4. Percent directed angler effort by species for Lake Fork Reservoir, Texas, June 2003 through May 2010.

Species	Year						
	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
Catfish	6.28	4.74	6.15	5.90	3.91	3.03	4.95
Yellow bass	0.03	0.39	-	0.09	-	-	-
Sunfish	0.35	0.45	-	1.08	-	-	-
Largemouth bass	71.81	77.79	81.57	80.32	84.37	87.15	73.53
Crappie	20.88	16.63	12.27	12.61	11.15	8.75	20.85
Anything	0.65	-	-	-	0.56	1.06	0.67

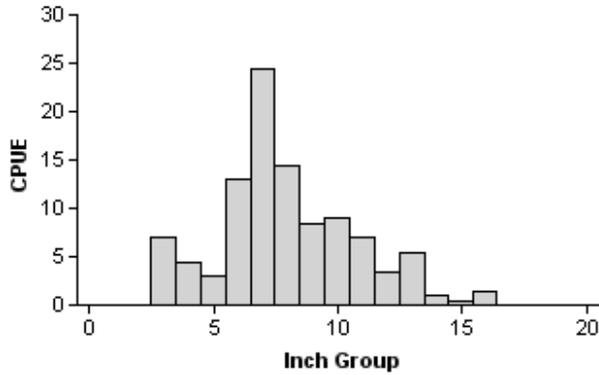
Table 5. Total fishing effort (h) for all species and total directed expenditures (and associated RSEs in parentheses) at Lake Fork Reservoir, Texas, June 2003 through May 2010.

Species	Year						
	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
Total fishing effort	649,856 (10)	786,911 (16)	717,074 (11)	807,892 (12)	874,230 (14)	1,128,269 (16)	709,457 (17)
Total directed expenditures	\$5,307,165 (18)	\$7,143,221 (22)	\$6,339,343 (17)	\$7,858,137 (17)	\$10,909,542 (22)	\$15,338,593 (24)	\$7,569,111 (28)

Gizzard shad

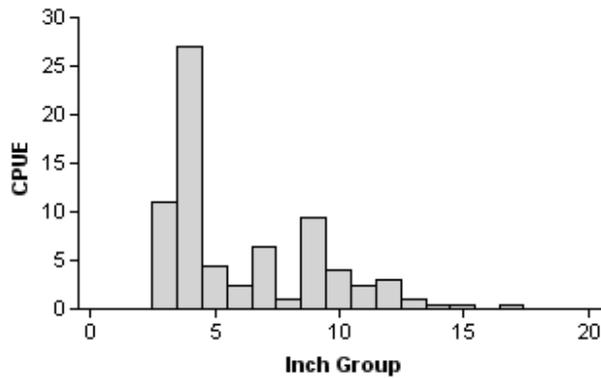
2006

Effort = 2.0
 Total CPUE = 103.0 (12; 206)
 Stock CPUE = 75.5 (15; 151)
 IOV = 50 (7.9)



2007

Effort = 2.0
 Total CPUE = 74.0 (44; 148)
 Stock CPUE = 29.0 (20; 58)
 IOV = 70 (11.1)



2009

Effort = 2.0
 Total CPUE = 148.5 (20; 297)
 Stock CPUE = 98.0 (20; 196)
 IOV = 50 (6.3)

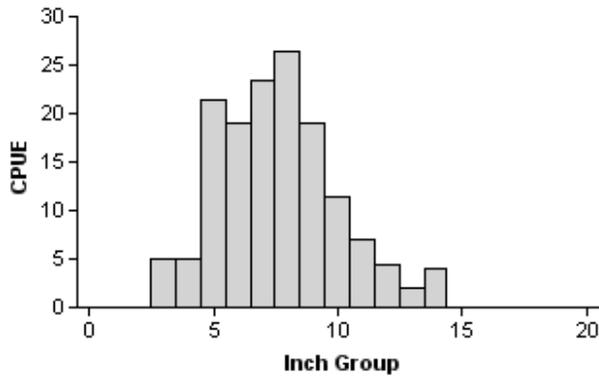
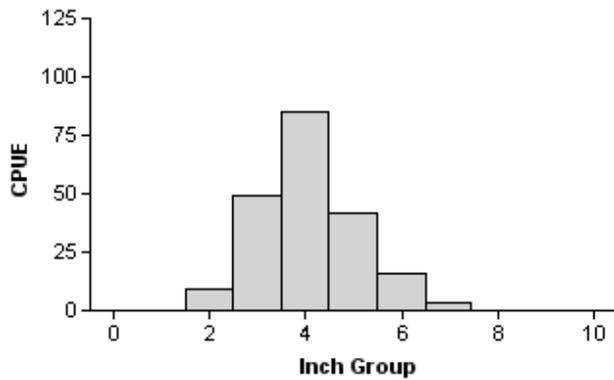


Figure 2. Number of gizzard shad caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for structural index and IOV are in parentheses) for fall electrofishing surveys, Lake Fork Reservoir, Texas, 2006, 2007, and 2009.

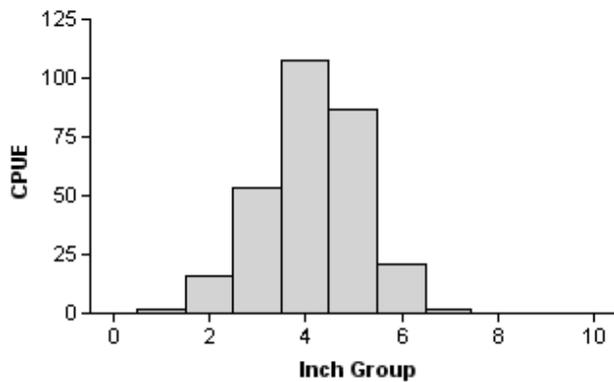
Bluegill

2006



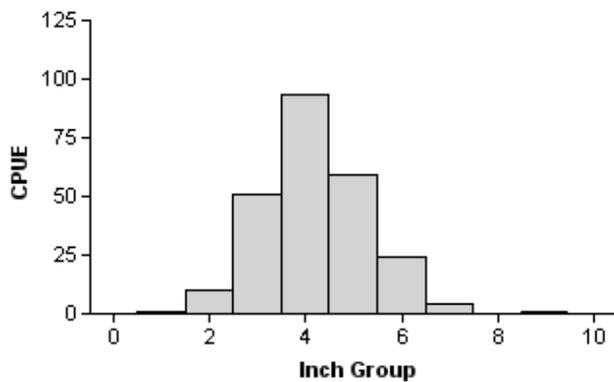
Effort = 2.0
 Total CPUE = 204.0 (14; 408)
 Stock CPUE = 195.0 (14; 390)
 PSD = 10 (1.6)

2007



Effort = 2.0
 Total CPUE = 287.5 (12; 575)
 Stock CPUE = 270.0 (13; 540)
 PSD = 8 (1.3)

2009

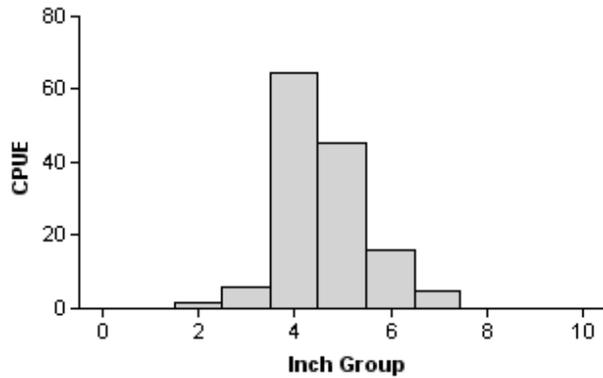


Effort = 2.0
 Total CPUE = 243.0 (16; 486)
 Stock CPUE = 232.0 (15; 464)
 PSD = 12 (2.2)

Figure 3. Number of bluegill caught per hour (CPUE, bars), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for fall electrofishing surveys, Lake Fork Reservoir, Texas, 2006, 2007, and 2009.

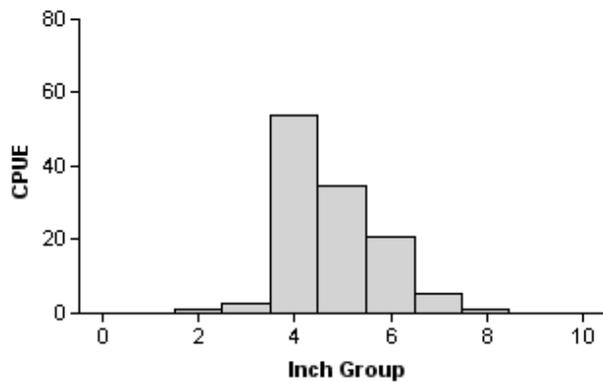
Redear sunfish

2006



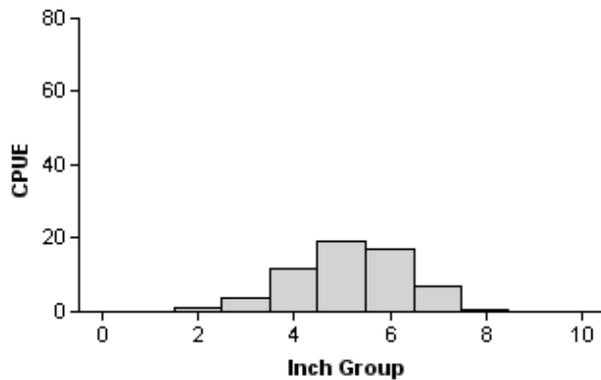
Effort = 2.0
 Total CPUE = 138.5 (18; 277)
 Stock CPUE = 131.0 (18; 262)
 PSD = 4 (1.3)

2007



Effort = 2.0
 Total CPUE = 119.5 (20; 239)
 Stock CPUE = 116.0 (19; 232)
 PSD = 6 (1.8)

2009



Effort = 2.0
 Total CPUE = 59.5 (19; 119)
 Stock CPUE = 55.0 (20; 110)
 PSD = 14 (3.5)

Figure 4. Number of redear sunfish caught per hour (CPUE, bars), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for fall electrofishing surveys, Lake Fork Reservoir, Texas, 2006, 2007, and 2009.

Table 6. Creel survey statistics for catfish (channel, blue, and flathead catfish combined) at Lake Fork Reservoir from June 2003 through May 2004, to June 2009 through May 2010, where total catch per hour is for anglers targeting catfish and total harvest is the estimated number of catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year						
	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
Directed effort (h)	40,809 (19)	37,311 (24)	44,109 (18)	47,663 (18)	34,213 (26)	34,221 (32)	35,112 (31)
Directed effort/acre	1.47 (19)	1.35 (24)	1.62 (18)	1.75 (18)	1.25 (26)	1.26 (32)	1.29 (31)
Total catch per hour	1.44 (24)	1.29 (37)	1.07 (27)	1.34 (24)	1.02 (24)	1.86 (36)	1.73 (55)
Catch/acre	2.87 (25)	2.74 (57)	1.90 (39)	3.21 (37)	3.67 (58)	11.45 (74)	4.22 (91)
Harvest per hour	1.44 (24)	0.84 (38)	0.78 (30)	0.89 (27)	0.86 (26)	0.98 (56)	1.18 (74)
Harvest/acre	1.85 (25)	2.02 (36)	1.14 (23)	2.18 (27)	2.66 (39)	8.95 (67)	2.52 (84)
Total harvest	50,466 (25)	55,165 (36)	31,031 (23)	59,404 (27)	72,585 (39)	243,991 (67)	68,724 (84)
Percent of legal sized fish released	29	32	1	20	66	27	49

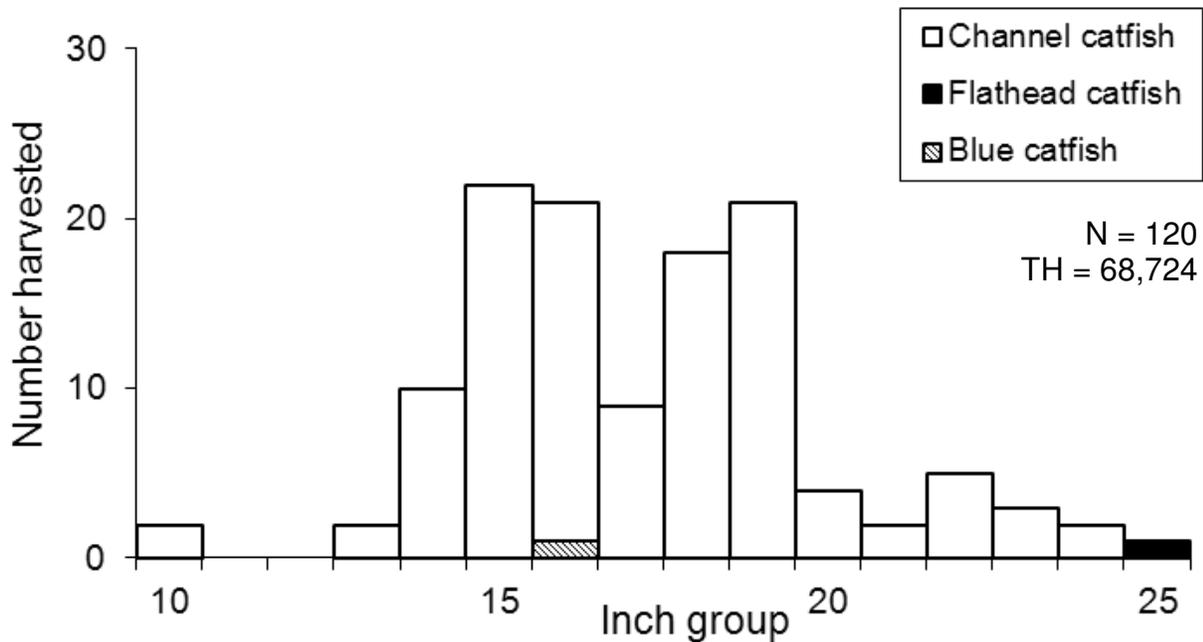
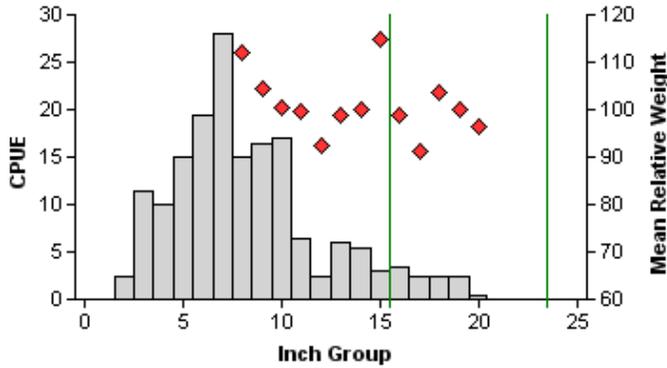


Figure 5. Length frequency of harvested catfish (flathead, blue, and channel combined) observed during creel surveys at Lake Fork Reservoir, Texas, June 2009 through May 2010, all anglers combined. N is the number of harvested catfish (species combined) observed during creel surveys, and TH is the total estimated harvest for the creel period.

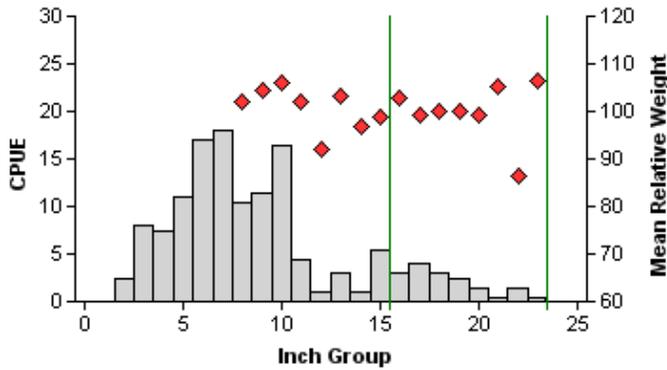
Largemouth bass - fall

2007



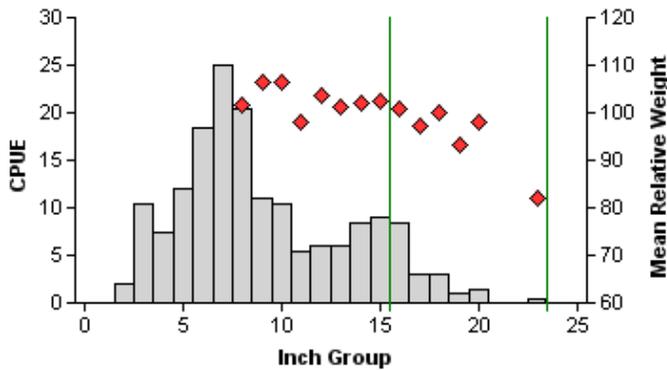
Effort = 2.0
 Total CPUE = 170.0 (14; 340)
 Stock CPUE = 83.5 (18; 167)
 PSD = 34 (4.8)
 PSD-P = 17 (2.4)

2008



Effort = 2.0
 Total CPUE = 134.0 (16; 268)
 Stock CPUE = 70.0 (15; 140)
 PSD = 39 (5)
 PSD-P = 31 (4.5)

2009



Effort = 2.0
 Total CPUE = 170.0 (15; 340)
 Stock CPUE = 94.5 (16; 189)
 PSD = 50 (5.1)
 PSD-P = 28 (3.1)

Figure 6. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for fall electrofishing surveys, Lake Fork Reservoir, Texas, 2007 through 2009. Vertical lines indicate the lower and upper bounds of the protected slot length limit at time of survey.

Largemouth bass - spring

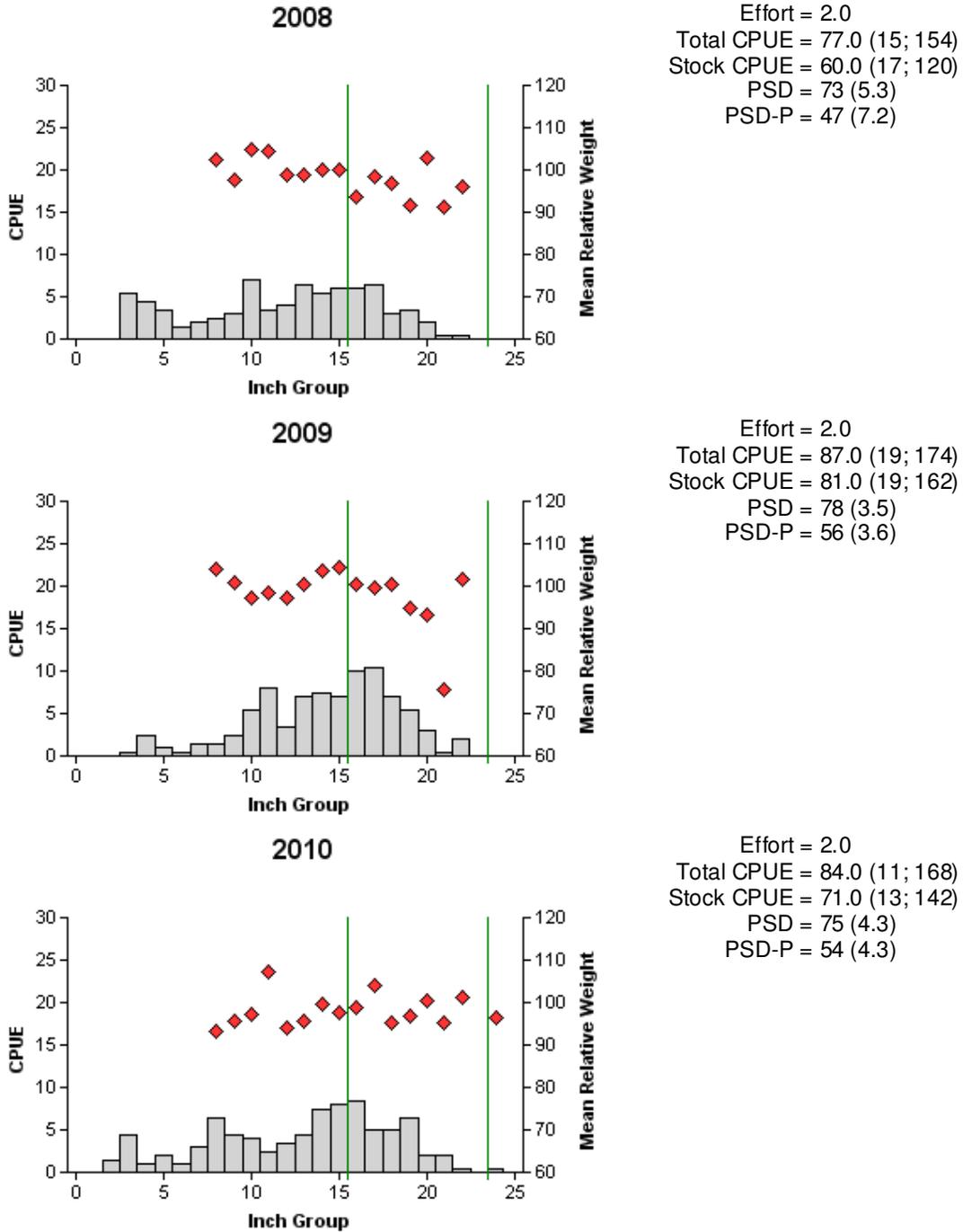


Figure 7. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for structural indices are in parentheses) for spring electrofishing surveys, Lake Fork Reservoir, Texas, 2008 through 2010. Vertical lines indicate the lower and upper bounds of the protected slot length limit at time of survey.

Table 7. Creel survey statistics for largemouth bass at Lake Fork Reservoir from June 2003 through May 2004, to June 2009 through May 2010, where total catch per hour is for anglers targeting largemouth bass and total harvest is the estimated number of largemouth bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year						
	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
Total directed effort (h)	466,640 (12)	612,123 (17)	584,952 (12)	648,899 (13)	737,589 (15)	983,325 (17)	521,650 (18)
Directed effort/acre	16.85 (12)	22.11 (17)	21.46 (12)	23.80 (13)	27.05 (15)	30.07 (17)	19.13 (18)
Live-release tournament effort	-	-	82,308	170,986	179,724	329,477	78,816
Percent of live-release tournament effort	-	-	14	26	24	34	15
Total catch per hour	0.36 (9)	0.45 (8)	0.44 (8)	0.40 (8)	0.41 (8)	0.41 (8)	0.64 (13)
Catch/acre	7.40 (15)	11.99 (21)	11.82 (18)	11.54 (17)	17.73 (22)	23.88 (23)	11.93 (20)
Harvest* per hour	0.01 (60)	0.03 (24)	0.01 (50)	0.02 (25)	0.03 (25)	0.04 (21)	0.06 (29)
Harvest*/acre	0.41 (38)	1.00 (12)	0.20 (27)	0.94 (29)	0.75 (31)	3.64 (47)	1.38 (49)
Total harvest*	11,140 (38)	27,184 (12)	5,346 (27)	25,545 (9)	20,490 (31)	99,140 (47)	37,579 (49)
Percent of harvest from live-release tournaments	-	-	89	83	89	86	95
Percent of legal sized fish released	66	72	59	57	57	56	52

* Harvest includes traditional harvest and fish temporarily retained during live-release fishing tournaments

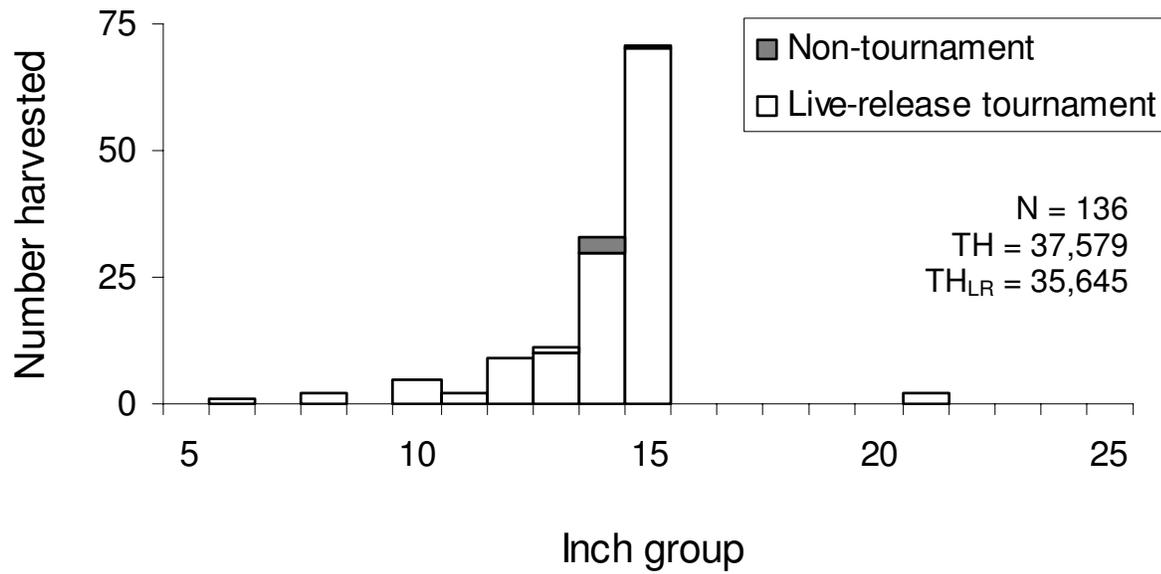


Figure 8. Length frequency of harvested largemouth bass observed during creel surveys at Lake Fork Reservoir, Texas, June 2009 through May 2010, separated by angler type. N is the number of harvested largemouth bass observed during creel surveys which includes fish transported to weigh-ins at live-release tournaments. TH is the total estimated harvest for the creel period and TH_{LR} is the total estimated number of fish retained by anglers participating in live-release tournaments.

Table 8. Results of genetic analysis of Age-0 largemouth bass collected by fall electrofishing, Lake Fork Reservoir, Texas, 1989 through 2009. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation intergrade between an FLMB and an NLMB, Fx = second or higher generation intergrade between an FLMB and an NLMB. Since 2006 analyses have been conducted using DNA microsatellite analysis. Prior to that time starch gel electrophoresis was employed.

Year	Sample size	Genotype					NLMB	% FLMB alleles	% pure FLMB
		FLMB	F1	Fx	Combined intergrades				
1989	30	2	8	13	21	7	31.7	6.7	
1990	30	1	12	15	27	2	44.2	3.3	
1991	30	4	5	15	20	4	51.8	13.3	
1992	35	3	11	16	27	5	39.3	8.6	
1993	35	2	7	18	25	8	33.6	5.7	
1994	35	1	3	23	26	8	38.6	2.9	
1995	35	0	8	17	25	10	31.4	0.0	
1996	35	5	7	19	26	2	53.7	14.3	
1997	50	4	12	27	39	6	40.3	8.0	
1998	54	1	6	37	43	10	31.9	1.8	
1999	35	2	14	10	24	9	34.3	5.7	
2000	55	4	15	29	44	7	50.5	7.3	
2001	56	3	6	28	34	19	31.9	5.4	
2002	50	6	14	28	42	2	58.0	12.0	
2003	50	3	33	10	43	4	41.0	6.0	
2004	50	2	13	31	44	4	54.0	4.0	
2005	59	2	3	51	54	3	43.1	3.0	
2006	30	0	a	a	30	0	48.0	0.0	
2007	30	0	a	a	30	0	53.4	0.0	
2008	30	0	1	29	30	0	52.0	0.0	
2009	30	0	0	30	30	0	48.0	0.0	

^aAnalysis did not separate F1 from Fx hybrids

Table 9. Creel survey statistics for crappie (white and black combined) at Lake Fork Reservoir from June 2002 through May 2003, to June 2008 through May 2009, where total catch per hour is for anglers targeting crappie and total harvest is the estimated number of crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year						
	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
Directed effort (h)	135,708 (13)	130,894 (18)	88,012 (14)	101,904 (13)	97,518 (16)	98,751 (20)	147,925 (19)
Directed effort/acre	4.90 (13)	4.73 (18)	3.23 (14)	3.74 (13)	3.58 (16)	3.62 (20)	5.43 (19)
Total catch per hour	2.17 (16)	2.03 (19)	1.62 (20)	1.69 (24)	1.86 (27)	1.93 (30)	1.49 (26)
Catch/acre	11.65 (21)	11.05 (29)	5.49 (17)	10.96 (31)	11.45 (35)	16.82 (47)	8.45 (32)
Harvest per hour	0.93 (18)	0.64 (21)	0.44 (28)	0.68 (24)	0.82 (27)	0.76 (29)	0.87 (32)
Harvest/acre	4.92 (26)	4.29 (41)	1.36 (31)	6.34 (40)	4.78 (32)	8.91 (48)	4.64 (44)
Total harvest	134,060 (26)	116,857 (41)	37,020 (31)	172,981 (40)	130,368 (32)	242,961 (48)	126,472 (44)
Percent of legal sized fish released	4	2	5	5	7	5	7

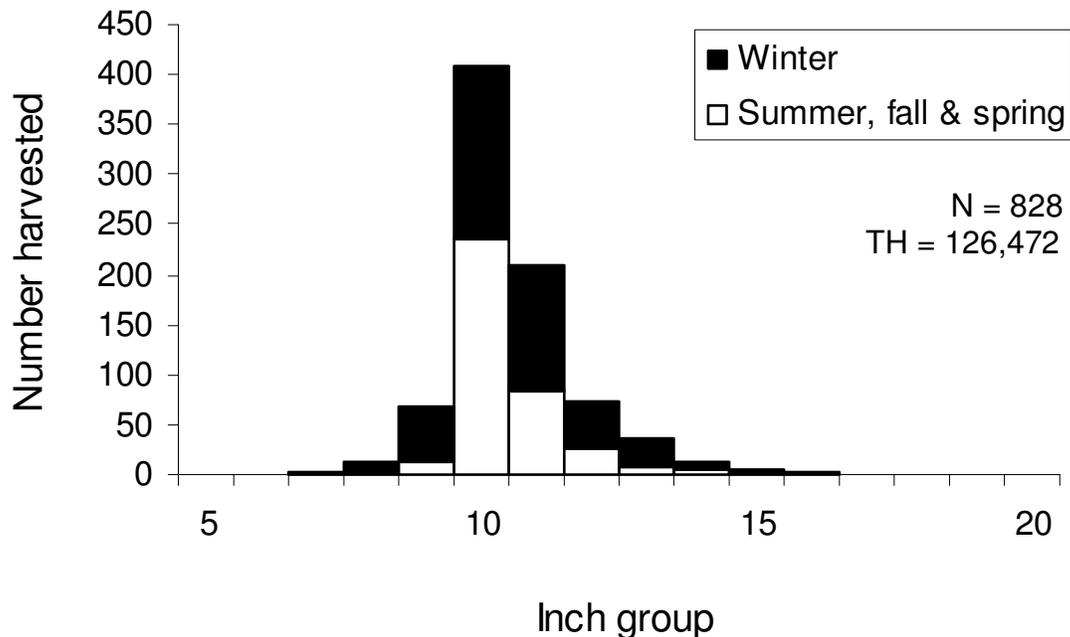


Figure 9. Length frequency of harvested crappie (white and black combined) observed during creel surveys at Lake Fork Reservoir, Texas, June 2009 through May 2010, all anglers combined separated by creel quarter. N is the number of harvested crappie observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 10. Proposed sampling schedule for Lake Fork Reservoir, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

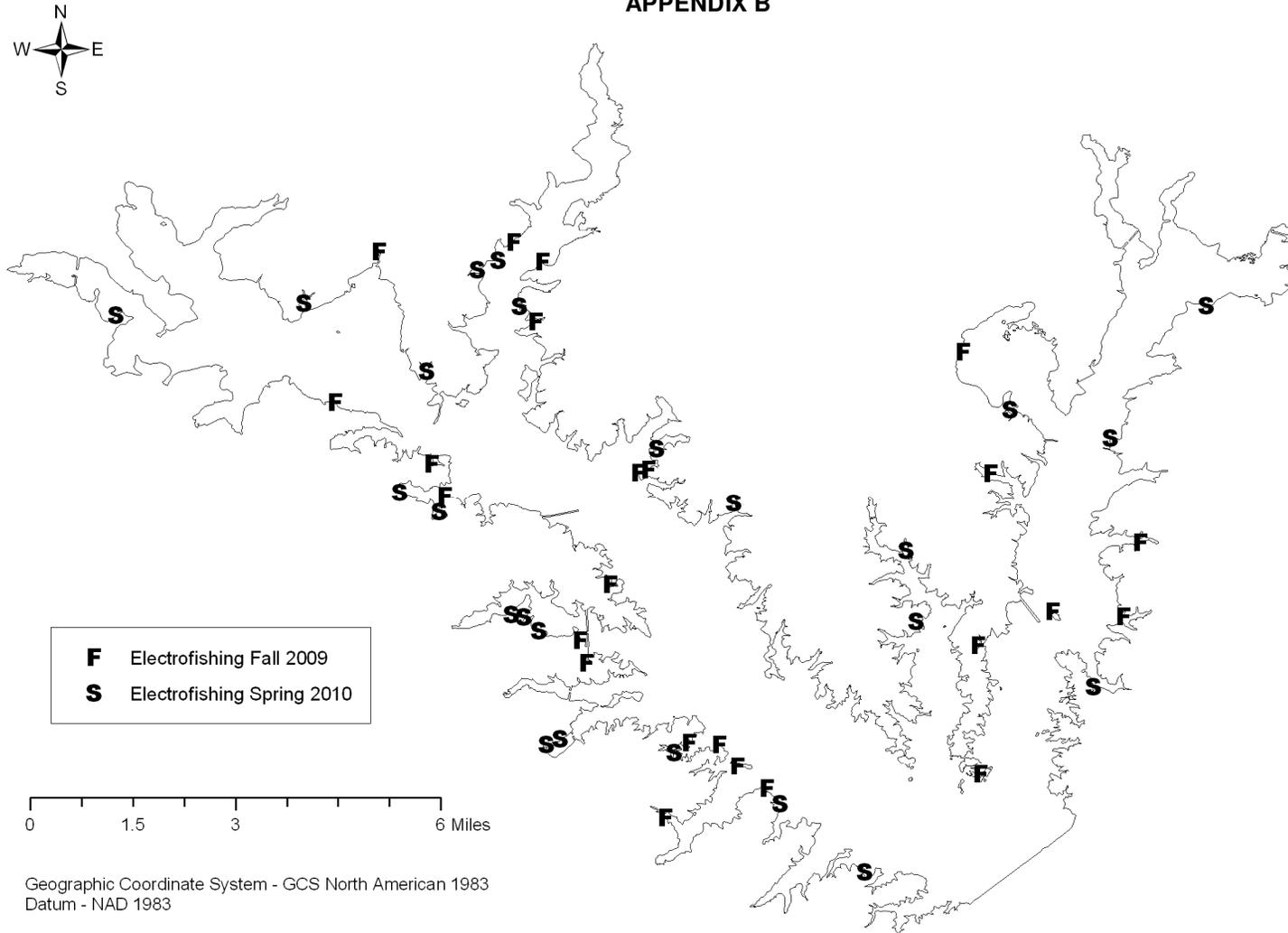
Survey Year	Electrofishing Spring	Electrofishing Fall	Gill netting	Creel survey	Vegetation survey	Habitat survey	Report
Summer 2010-Spring 2011	A	A		S	A		
Summer 2011-Spring 2012	A	S	S	S	S	S	S
Summer 2012-Spring 2013	A	A		S	A		
Summer 2009-Spring 2010	A	A		S	A		A

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from fall electrofishing from Lake Fork, Texas, 2009.

Species	Electrofishing	
	N	CPUE
Gizzard shad	297	148.5
Threadfin shad	109	54.5
Warmouth	9	4.5
Bluegill	486	243.0
Longear sunfish	39	19.5
Redear sunfish	119	59.5
Largemouth bass	340	170.0

APPENDIX B



Location of fall electrofishing, and spring electrofishing sites, Lake Fork Reservoir, Texas, 2009-2010.

Appendix C

Estimated water hyacinth surface area (acres) at Lake Fork, Texas, estimated in summer (August or September) for various years.

Year	Acres
1996	40
1998	125
1999	7
2000	130
2001	50
2002	6
2003	3
2004	49
2005	74
2006	10
2007	12
2008	39
2009	400*

*Combined estimate of District 3B (200 acres) and Aquatic Habitat Enhancement staff (200 acres)

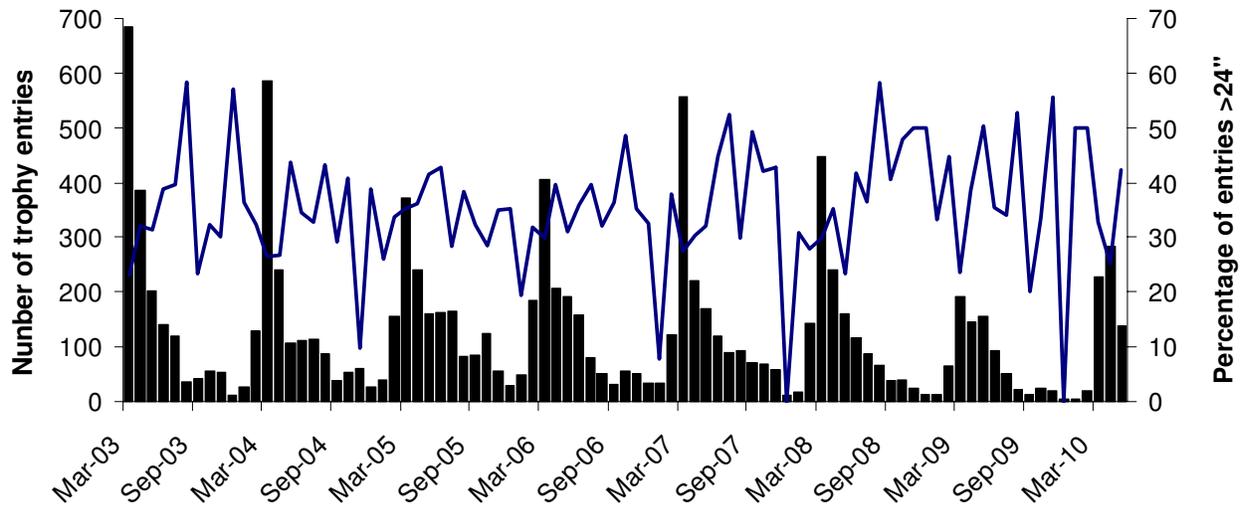
Appendix D

Water body records, all tackle category, for Lake Fork as of 6/3/2010

Species	Weight (lbs)	Length (inches)	Date certified	Gear
Bass, hybrid yellow ^a	4.75	19.00	3/12/2005	Rod & reel
Bass, largemouth ^a	18.18	25.50	1/24/1992	Rod & reel
Bass, Palmetto	7.96	24.25	5/26/2009	Rod & reel
Bass, spotted	3.03	17.00	9/13/2007	Rod & reel
Bass, white	3.97	18.25	2/8/2006	Rod & reel
Bass, yellow	1.37	12.25	11/19/1997	Rod & reel
Bluegill	1.61	11.50	7/9/1995	Rod & reel
Bowfin ^a	17.65	36.50	2/21/1993	Rod & reel
Buffalo, bigmouth	36.00	33.50	10/19/1997	Rod & reel
Buffalo, smallmouth	57.75	-	11/8/2007	Rod & reel
Bullhead, black	2.48	16.25	2/1/1995	Cane Pole
Bullhead, yellow ^a	3.20	16.25	3/22/1997	Rod & reel
Carp, common	36.50	36.50	4/10/1999	Trotline
Catfish, blue	89.00	49.25	3/1/2002	Trotline
Catfish, channel	25.33	35.50	5/9/2007	Trotline
Catfish, flathead	100.00	55.00	4/27/2007	Trotline
Crappie, black ^a	3.92	18.50	4/27/2003	Rod & reel
Crappie, white	3.19	17.00	2/5/1993	Rod & reel
Drum, freshwater	22.50	33.00	4/23/2010	Rod & reel
Gar, longnose	24.38	50.00	5/4/2009	Bow & arrow
Gar, spotted	10.85	40.50	6/23/2009	Bow & arrow
Shad, Gizzard	1.44	16.25	6/16/2009	Bow & arrow
Sunfish, hybrid	0.23	6.65	9/14/1999	Fly rod
Sunfish, longear ^a	0.48	7.50	6/1/1998	Rod & reel
Sunfish, orangespotted ^a	0.18	6.00	11/26/2005	Rod & reel
Sunfish, redear	1.27	12.75	6/2/1995	Rod & reel
Warmouth	0.84	9.5	5/16/2004	Rod & reel

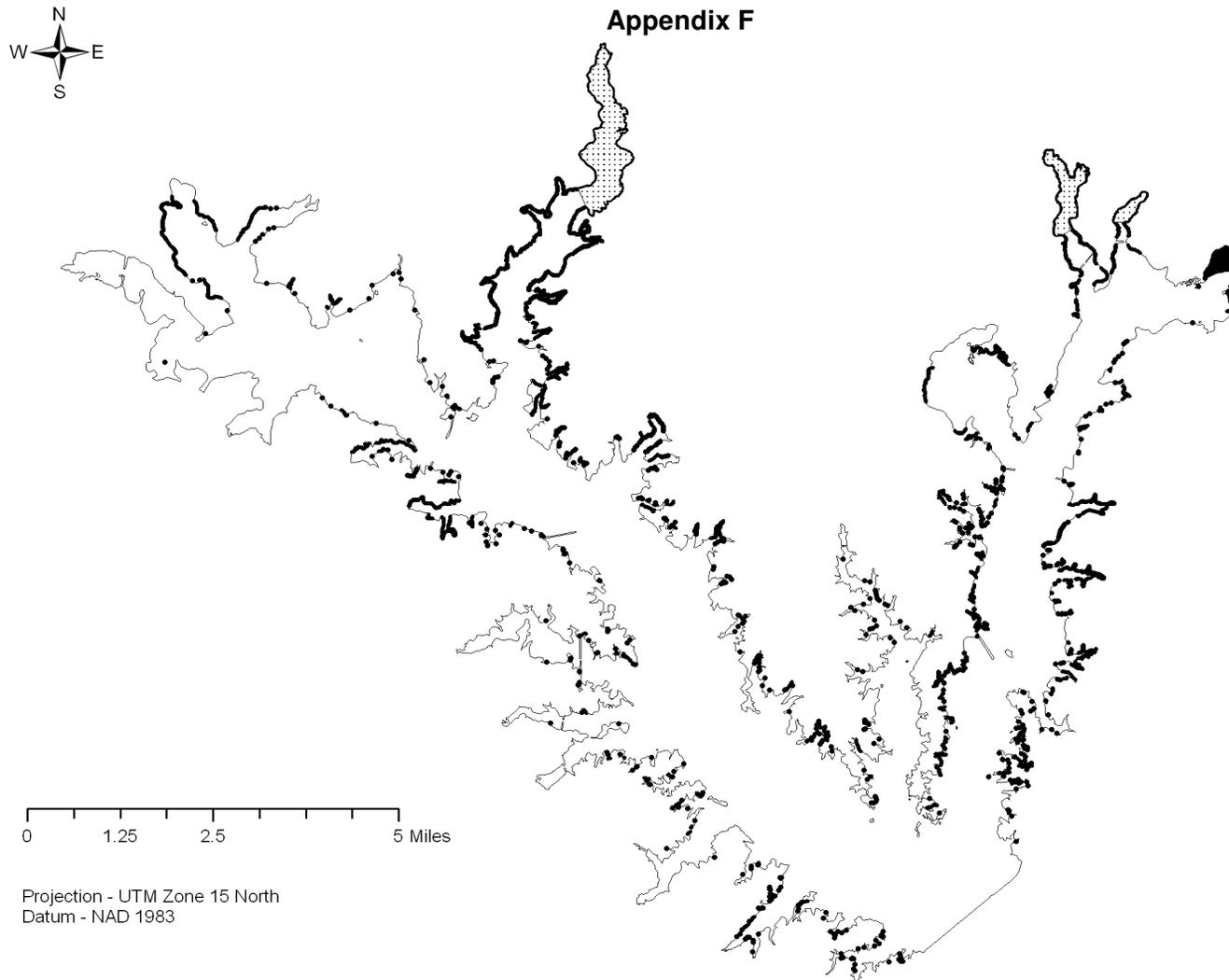
^aState record

Appendix E



Monthly total numbers of largemouth bass entries reported (solid bars) in the Lake Fork Trophy Bass Survey, March 2003 – May 2010, and percentage of monthly entries that were ≥ 24 inches (line). Numbers represent combined weighed and estimated entries.

Appendix F



Distribution of water hyacinth in Lake Fork, September 2009. Total estimated area 400 acres. Gray shaded areas represent inaccessible areas containing water hyacinth that were assessed by Aquatic Habitat Enhancement staff. Display of coverage not to scale.

Appendix G

Estimates of quarterly fishing effort (h) by species groups and quarterly directed expenditures at Lake Fork Reservoir, Texas, June 2009 through May 2010.

Directed effort (h)	Summer 2009	Fall 2009	Winter 2010	Spring 2010	Total
Bass	155,560	56,566	48,487	261,037	521,650
Crappie	30,930	29,445	31,166	56,384	147,925
Catfish	19,954	4,784	671	9,703	35,112
Anything		273		4,497	4,770
Total directed effort (h)	206,444	91,068	80,324	331,621	709,457
Quarterly trip expenditures (\$)	\$2,061,482	\$794,290	\$707,146	\$4,006,193	\$7,569,111

Appendix H

Angler responses to questions regarding preferences about catfish angling at Lake Fork Reservoir, Texas, September 2008 through August 2009.

		Catfish rod & reel	Catfish passive gear	Other species	Number of responses
1	Are you satisfied with the current catfish regulations on this lake?				
1	Very dissatisfied	-	-	-	
2	Dissatisfied	-	-	1 (2%)	1
3	Neutral	1 (2%)	-	4 (8%)	5
4	Satisfied	6 (12%)	1 (2%)	14 (28%)	21
5	Very satisfied	5 (10%)	1 (2%)	17 (34%)	<u>23</u>
					50
2	For a successful fishing trip, what is more important to you?				
1	Numbers of legal-sized fish caught	5 (10%)	-	12 (24%)	17
2	A few large/trophy fish	2 (4%)	-	7 (14%)	9
3	No preference	5 (10%)	2 (4%)	17 (34%)	<u>24</u>
					50
3	If you catch a large/trophy catfish what would you do with it?				
1	Always keep it	2 (4%)	2 (4%)	2 (4%)	6
2	Sometimes keep it	4 (8%)	-	5 (10%)	9
3	Always release it	6 (12%)	-	29 (58%)	<u>35</u>
					50
4	Do you think that protecting large/trophy catfish would improve the fishery of this lake?				
1	Yes	7 (15%)	-	18 (38%)	25
2	No	5 (10%)	2 (4%)	16 (33%)	<u>23</u>
					48